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Prepartying, Drinking Games, and Extreme Drinking among College Students: A Daily-Level Investigation

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Abstract

Daily data collected over 14 consecutive days were used to examine whether extreme drinking was more likely on days college students reported prepartying (i.e., drinking before going out) or playing drinking games in a multi-ethnic sample of college seniors (analysis subsample: $N=399$; 57% women; M age=21.48 years, $SD=.40$). Multilevel modeling with drinking occasions at Level 1 (1265 drinking days) nested within persons at Level 2 (399 drinkers) were used to predict four extreme drinking behavior outcomes at the daily level: consuming at least 8/10 (women/men) drinks, reaching an estimated blood alcohol concentration (eBAC) of .16% or greater, drinking enough to stumble, and drinking enough to pass out. Prepartying only (29% of drinking days) was more common than playing drinking games only (10%) or engaging in both behaviors on the same day (13%). Odds of extreme drinking were greater among students who frequently engaged in prepartying (ORs : 1.86-2.58) and drinking games (ORs : 1.95-4.16), except prepartying frequency did not predict drinking enough to pass out. On days students prepartied (ORs : 1.58-2.02) and on days they played drinking games (ORs : 1.68-1.78), odds of extreme drinking were elevated, except drinking games did not predict eBAC of .16% or greater. Extreme drinking is attributable

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Contributors

Dr. Fairlie conducted data analysis and wrote the main text. Dr. Maggs led study design and data collection and assisted in writing and editing. Dr. Lanza assisted in data analysis, writing, and editing. All authors jointly conceptualized the manuscript and have contributed to and approved the final manuscript.

Conflict of interest

The authors declare no conflicts of interest.

to both person-level characteristics (e.g., preparty frequency) and specific drinking behaviors on a given day. Prepartying and drinking games confer elevated risk of extreme drinking and are important targets in alcohol interventions for college seniors.

Keywords

preparty; drinking games; extreme drinking; college; daily level

1. Introduction

Research increasingly examines prepartying and drinking games among college students because these behaviors are positively associated with intoxication and negative consequences (Barry, Stelfox, Piazza-Gardner, Chaney, & Dodd, 2013; Borsari, 2004; Cameron et al., 2010; Paves, Pedersen, Hummer, & LaBrie, 2012; Pedersen & LaBrie, 2007). Prepartying (or pregaming/preloading) is consuming alcohol prior to attending social functions where drinking may or may not take place (Paves et al., 2012). Drinking games occur in a social context where individuals engage in a common activity (e.g., motor skill task) during which they drink according to a set of rules (Borsari, 2004; LaBrie, Ehret, & Hummer, 2013; Zamboanga, Calvert, O'Riordan, & McCollum, 2007). Drinking games are thought to promote fast-paced drinking, thus increasing risk for intoxication and consequences. Our study uses daily data to investigate associations of prepartying and drinking games with the likelihood of extreme drinking.

1.1 Limitations in the literature

Knowledge gaps remain about the effects of prepartying and drinking games on alcohol consumption. First, studies typically rely on reports of most recent drinking occasions (Hummer, Napper, Ehret, & LaBrie, 2013) and/or typical behavior (Haas, Smith, Kagan, Jacob, 2012; LaBrie et al., 2013; Pedersen, LaBrie, & Kilmer, 2009), which do not assess variation across occasions. Second, studies have been predominantly cross-sectional and cannot rule out the competing hypothesis that a person-level stable variable (e.g., sensation-seeking) explains associations of prepartying and drinking games with extreme drinking. Furthermore, cross-sectional studies cannot examine daily-level associations that test whether extreme drinking is more likely on days when an individual preparties or plays drinking games compared to days when the same individual does not (Borsari et al., 2007; Haas et al., 2012; Hummer et al., 2013). In this study, we use prospective daily data to compare days with and without prepartying and drinking games, thus controlling for person-level characteristics. This study adds to an emerging literature examining daily-level associations between prepartying and drinking (Barnett, Orchowski, Read, & Kahler, 2013; Kuntsche & Labhart, 2013; Labhart, Graham, Wells, & Kuntsche, 2013; Merrill, Vermont, Bachrach, & Read, 2013; Read, Merrill, & Bytschkow, 2010). This study also contributes to the very limited daily-level studies on drinking games (Pedersen & LaBrie, 2006).

1.2 Current investigation

Extreme drinking was operationalized with four measures: extreme heavy drinking (8+/10+ drinks for women/men); estimated blood alcohol concentration (eBAC) .16%; drinking

enough to stumble; and drinking enough to pass out. Although alternative definitions exist (Courtney & Polich, 2009; Jackson, 2008), we selected these measures since each adjusts for individual differences in impairment and because consuming more drinks and higher eBACs increase risk for serious consequences (Mundt, Zakletskaia, & Fleming, 2009; Neal & Carey, 2007; Polak & Conner, 2012; Read, Beattie, Chamberlain, & Merrill, 2008).

We examined whether extreme drinking was more likely on days that college students reported prepartying and drinking games, compared to days they did not, independent of how frequently students prepartied and played drinking games. The present aims were to: (1) document the prevalence of prepartying, drinking games, and extreme drinking at the daily level, and (2) estimate the extent to which engaging in prepartying, drinking games, or both on a given day was associated with extreme drinking.

2. Methods

2.1 Participants and procedure

The University Life Study (Patrick & Maggs, 2011; Small, Bailey-Davis, Morgan, & Maggs, 2013) recruited first-time, full-time college students who were U.S. citizens/permanent residents, under age 21, and residing within 25 miles of campus to participate in an intensive study focused on alcohol use and sexual behavior ($N = 744$; 65% of those invited consented and participated). The sampling frame was drawn from a registrar list of first-year students who met study eligibility criteria and had provided race/ethnicity. Among students in the sampling frame, a stratified random sampling procedure recruited students from 8 strata (male and female; 4 major US race/ethnic groups) to achieve a diverse sample with respect to sex and race/ethnicity. The university's overall student population includes a higher proportion of white students than the current sample. Beginning Fall/Autumn semester of students' 1st year, participants were invited to complete an extensive web survey and a burst of up to 14 consecutive daily, brief web surveys; this procedure was followed across seven consecutive semesters. The study was overseen by the university's institutional review board and protected by a federal Certificate of Confidentiality.

Descriptive analyses used daily data ($N=592$; 55% women) collected during Semester 7 (Fall of students' 4th year). Those who had dropped out by Semester 7 were more likely to be male, $\chi^2(1, N=744) = 16.34, p < .001$. Semester 7 incentives were a \$40 semester survey incentive and \$3 per daily survey incentive with an \$18 bonus for completing all 14 surveys. The subsample for the multilevel models included students who reported drinking at least once during a two-week period ($N=399$; 57% women; M age=21.48 years, $SD=.40$). Among the subsample, the majority were current students (91%) and completed 12 or more of 14 days (85%; $M=12.89$ daily reports, $SD=2.45$). Roughly 60% of participants' mothers and 61% of participants' fathers received a college degree or higher. Based on self-reports, the subsample can be described as 30% Hispanic/Latino American, 30% European American, non-Hispanic/Latino (NHL), 20% Asian American NHL, 13% African American NHL, and 7% Multiracial American NHL.

2.2 Measures

2.2.1 Predictors—For each drinking day participants indicated how many drinks were consumed *prepartying* (i.e., pregameing; drinks were consumed before going out) and whether they participated in any *drinking games*. Effect coding (−1=no, 1=yes) facilitated interpretation of a Prepartying × Drinking Games interaction. Sex (0=female, 1=male) was included as a covariate, given that a larger proportion of college men than women drink at high levels (White, Kraus, & Swartzwelder, 2006).

2.2.2 Outcomes—Four extreme drinking behavior outcomes were computed for each drinking day. Number of alcoholic drinks¹ consumed the prior day (range 0 to 25+) was coded for *extreme heavy drinking* defined as 8+/10+ drinks (women/men) where 0=no and 1=yes (White et al., 2006).

Daily eBAC was calculated from total number of drinks, hours drank, sex, and weight (assessed Semester 7) (Matthews & Miller, 1979). Given potential for impaired balance and unconsciousness (National Institute on Alcohol Abuse and Alcoholism, 2013), a cutoff of .16% (twice the US legal limit for driving) was used to denote *eBAC* .16% (0=no, 1=yes).

Two indicators of subjective intoxication were computed. In the Semester 7 survey, participants were asked “after how many drinks would you begin stumbling or walking in an uncoordinated manner?” and “how many drinks would it take for you to pass out or fall asleep when you did not want to?” (Schuckit, Tipp, Smith, Wiesbeck, & Kalmijn, 1997). Each reported day that the number of drinks consumed met or exceeded individual estimated thresholds was coded as 1; other days were coded as 0 (Maggs, Williams, & Lee, 2011). The resulting indicators were named *drinking enough to stumble* and *drinking enough to pass out*.

2.3 Analytic strategy

Multilevel modeling accounted for clustering of occasions (Level 1) within persons (Level 2) using SAS Version 9.3 PROC GLIMMIX with a logit function for binary outcomes. *P*-values were adjusted using the Benjamini-Hochberg method (Benjamini & Hochberg, 1995). Analyses included only drinking days to test whether extreme drinking was more likely on days students reported prepartying and playing drinking games, compared to days they did not. Level-1 predictors included prepartying (PRE; person-centered), drinking games (DG; person-centered), and their interaction. Level-2 predictors of the intercept included sex and person-specific means for prepartying and drinking games. The combined equation was

¹The survey stated that “one drink” meant 0.5 ounces of absolute alcohol, for example a 12-ounce can/bottle of beer or cooler, 5-ounce glass of wine, or a drink containing 1 shot of liquor/spirits. Note that these definitions are similar to 14 grams of pure alcohol in a drink.

$$\begin{aligned}
\log(\pi/1 - \pi) = & \gamma_{00} + \gamma_{10} * (PRE_{it} - \overline{PRE}_i)_{it} \\
& + \gamma_{20} * (DG_{it} - \overline{DG}_i)_{it} \\
& + \gamma_{30} * (PRE_{it} - \overline{PRE}_i)_{it} (DG_{it} - \overline{DG}_i)_{it} \\
& + \gamma_{01} * \text{MaleSex}_i + \gamma_{02} * \overline{PRE}_i + \gamma_{03} * \overline{DG}_i + \mu_{0i},
\end{aligned}$$

where occasions t were nested within persons i . By including person-specific means [e.g., $\overline{PRE}_i$] and person-centered variables [e.g., $(PRE_{it} - \overline{PRE}_i)_{it}$], effects of how frequently a person engaged in the behaviors in general across the sampled days could be separated from effects of engaging in the behaviors on a given day. Random effects for prepartying and drinking games were not significant and thus eliminated.

3. Results

3.1 Daily drinking behaviors

Participants reported drinking on 17% of 7401 observed days (Table 1, left column). A third of the 592 participants did not report drinking on the sampled days. Half reported drinking on one to four days and the remainder on five or more days. Subsequent analyses include the 399 participants who drank at least once.

On 48% of 1265 drinking days, participants reported neither prepartying nor drinking games (Table 1, right column). Prepartying only was more common than drinking games only or engaging in both behaviors on the same day. Drinking enough to stumble was the most common outcome followed by extreme heavy drinking, eBAC .16%, and drinking enough to pass out.

3.2 Effects of prepartying and drinking games

For the unconditional models, intraclass correlations (range .39-.53) showed variation in the likelihood of the drinking outcomes between people and across occasions. Between-person effects (Level 2) showed that, among participants who reported any drinking, men had approximately twice the odds of extreme heavy drinking than women (Table 2). Students who prepartied more often across the two weeks had greater odds of extreme drinking on a given day than students who prepartied less often, except in models predicting drinking enough to pass out. Students who played drinking games more often had greater odds of extreme drinking on a given day than students who played drinking games less often.

Daily effects (Level 1) showed that on days that students prepartied, the likelihood of all four extreme drinking outcomes was higher than days they did not. On days that students played drinking games, the likelihood of extreme drinking outcomes was higher, except in models predicting eBAC .16%. No Prepartying $\times$ Drinking Games interactions were significant.²

4. Discussion

4.1 Key findings

On days that fourth-year college students prepartied or played drinking games, the likelihood of consuming 8+/10+ drinks, drinking enough to stumble, and drinking enough to pass out were elevated. Prepartying, but not drinking games, was associated with an eBAC .16% at the daily level. Findings extend prior research by evaluating the likelihood of extreme drinking for a given individual on drinking days with versus without prepartying or drinking games. Drinking games may not be associated with high eBAC at the daily level because rate of drinking largely determines peak eBAC; individuals may drink quickly in other contexts besides drinking games.

Students' frequencies of prepartying and playing drinking games were associated with elevated risk for extreme drinking. Odds of extreme heavy drinking (8+/10+) were elevated among students who frequently played drinking games, which may stem from reasons underlying these behaviors. Although not tested, students may play drinking games to compete or become intoxicated (Borsari, 2004; Johnson & Sheets, 2004), whereas students may preparty to save money (LaBrie, Hummer, Pedersen, Lac, & Chithambo, 2012; Pedersen et al., 2009).

4.2 Limitations

First, no information was collected on *when* students played drinking games in relation to prepartying (sequentially or concurrently). Second, each student provided data for one 14-day period. Although data collection spanned 7 weeks, these 2-week periods may not be representative of the entire semester or college experience.

4.3 Implications and future directions

Prepartying and drinking games confer elevated risk of extreme drinking. Important next steps include testing whether these behaviors increase the likelihood of consequences (e.g., injuries, unsafe sex) on a given day. If motivations for prepartying and playing drinking games moderate associations between these behaviors and extreme drinking (Kuntsche & Labhart, 2013), reasons for engaging in these behaviors may be important intervention components. Finally, research should assess specific prepartying and drinking game contexts and behaviors, including quantity consumed, duration, and companions (Labhart, Wells, Graham, & Kuntsche, 2014).

This study used prospective daily data to demonstrate that an increased likelihood of extreme drinking was attributable to person-level characteristics (e.g., preparty frequency) and specific drinking behaviors on a given day. All four extreme drinking outcomes accounted for individual differences in alcohol metabolism: extreme heavy drinking was sex-specific; eBAC accounted for sex, weight, and time drank; and drinking enough to

²Multilevel models were evaluated using the traditional cutoff of 4+/5+ drinks for women/men as the outcome. The results were similar to those reported here for extreme heavy drinking (8+/10+ drinks) with regard to significance and interpretation; the only exception was that sex was not a significant Level 2 predictor for 4+/5+ drinks. That is, no sex difference was found when the traditional lower sex-specific cutoff was used.

stumble and to pass out were based on self-reported thresholds. These alternative measures provide new insights about extreme drinking (Patrick et al., 2013).

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Highlights

- Extreme drinking included 8+/10+ (women/men) drinks and drinking enough to stumble.
- Extreme drinking more likely among students who prepartied or played drinking games.
- Extreme drinking more likely on days with prepartying or drinking games.

Table 1

Proportion of days various alcohol behaviors were reported on all observed days and on drinking days.

Type of day	All observed days ^a	Drinking days ^b
Drinking days	.17 (1265/7401)	1.00 (1265/1265)
Predictors ^c		
Neither prepartying nor drinking games	.91 (6729/7368)	.48 (593/1232)
Prepartying only	.05 (357/7368)	.29 (357/1232)
Drinking games only	.02 (122/7368)	.10 (122/1232)
Both prepartying and drinking games	.02 (160/7368)	.13 (160/1232)
Outcomes		
Extreme heavy drinking	.04 (275/7401)	.22 (275/1265)
eBAC .16% ^d	.03 (218/7366)	.18 (218/1230)
Drinking enough to stumble	.05 (361/7401)	.29 (361/1265)
Drinking enough to pass out	.02 (171/7401)	.14 (171/1265)

^a592 participants reported on 7401 observed days.

^b399 participants reported on 1265 drinking days; the remaining 193 participants were excluded from subsequent analyses.

^cDue to missing data for prepartying and drinking games, the denominator reduces from 7401 to 7368 for all observed days and from 1265 to 1232 for drinking days.

^dThe denominator reduces due to missing data for eBAC .16%.

Table 2

Multilevel models using prepartying and drinking games to predict likelihood of extreme drinking at the daily-level.

Parameter	Extreme heavy drinking			eBAC .16%			Drinking enough to stumble			Drinking enough to pass out		
	OR (95% CI)	BH adjusted <i>p</i> -value ^a		OR (95% CI)	BH adjusted <i>p</i> -value		OR (95% CI)	BH adjusted <i>p</i> -value		OR (95% CI)	BH adjusted <i>p</i> -value	
Level 2 (Persons)												
Male sex	2.17 (1.25, 3.76)	.006		0.65 (0.37, 1.14)	ns		0.75 (0.47, 1.20)	ns		0.87 (0.46, 1.67)	ns	
Partying (mean) ^b	2.35 (1.58, 3.49)	< .001		2.58 (1.71, 3.89)	< .001		1.86 (1.34, 2.58)	< .001		1.53 (0.97, 2.40)	ns	
DG (mean)	4.16 (2.55, 6.81)	< .001		2.84 (1.77, 4.56)	< .001		1.95 (1.30, 2.93)	.001		2.28 (1.32, 3.93)	.003	
Level 1 (Days)												
Partying (centered) ^c	1.58 (1.24, 1.99)	< .001		1.93 (1.50, 2.48)	< .001		2.02 (1.63, 2.51)	< .001		1.89 (1.41, 2.53)	< .001	
DG (centered)	1.78 (1.40, 2.27)	< .001		1.08 (0.84, 1.40)	ns		1.68 (1.34, 2.12)	< .001		1.70 (1.27, 2.29)	< .001	
Partying × DG	0.70 (0.51, 0.98)	ns		0.81 (0.57, 1.16)	ns		0.80 (0.59, 1.09)	ns		0.84 (0.56, 1.27)	ns	

Note. DG = drinking games.

^a All adjusted *p*-values were calculated by the Benjamini-Hochberg method to control for multiple tests and maintain an alpha level of .05 (Benjamini & Hochberg, 1995).

^b At Level 2, the person-specific means of prepartying and drinking games were used.

^c At Level 1, the person-centered values of prepartying and drinking games were used.